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TOPOGRAPHIC MAPPING BY THE U.S. GEOLOGICAL SURVEY IN FLORIDA

by Daniel Kennedy

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TOPOGRAPHIC MAPPING BY THE U. S. GEOLOGICAL SURVEY IN FLORIDA

Daniel Kennedy

In presenting this paper on topographic mapping in Florida, I am conscious of the fact that many of you may have read papers given by Survey personnel before meetings of the A.S.C.E. and, therefore, are familiar with the historical background of mapping by the Geological Survey.

For operational efficiency, the Topographic Division of the Geological Survey consists of a Division headquarters in Washington, headed by the Chief Topographic Engineer, with two staff branches that do the required work of research, technical control, planning, and coordination, and with the normal complement of administrative personnel for fiscal, personnel, and procurement purposes. The actual map making is done by the regional offices, of which there are four. These are located at Sacramento, California; Denver, Colorado; Rolla, Missouri; and Arlington, Virginia. The area covered by the regions varies both in size and number of States. Central region has sixteen States, one of which is Florida. This will account for my presence today in discussing the current Florida program.

It was interesting to read an article in the St. Cloud News concerning the origin of the water control program for southern Florida about seventy years ago, for it was about this time that the Survey itself was born (to be exact, in 1879), and shortly thereafter the topographic unit began its life. It would indeed be a chore to record the many problems of these two specialties of the civil engineering field since then and, certainly, an impossibility in the time allowed during this meeting. However interesting these problems would be to us today, they would have little value unless we profited by them. As in other fields of engineering, those of us in mapping have progressed by trial and error.

This has wrought changes in personnel and equipment of the topographic mapping specialities. The early topographer, using transits, sextants, chronometers, and barometers, has been replaced by the engineer with theodolites, prism levels, radar altimers, shoran equipment, stereophotogrammetric machines, and electric computing instruments. The airplanes and helicopters provide air photos and transportation.

However, with all this fine equipment and the know-how to use it, the topographic engineer must yet depend a great deal on the whims of nature to do his work well. Weather conditions and the natural conditions of swamp and wilderness, with little or no means of communication, provide a continuing challenge. We are certain to meet these conditions when we map the southern part of Florida.

Since the sixteenth century, Florida has been shown on many maps, and yet the topographic data of today regarding it are far from complete. The early maps showed it both as an island and a mountainous peninsula, and while it was one of the first places upon which the white man set foot in the Western Hemisphere, it is still unmapped topographically. Until our present program was started in the fall of 1951, only thirty per cent of the State had been mapped. During the past two winter seasons, an additional fifteen per

cent of the maps have been placed in production, and our plan, if continued, will complete the mapping of the entire State by 1957.

Many of you will wonder why we have the large mapping program of today. Such a question would be equally pertinent to other parts of the country, as the demand for accurate topographic maps is great in most all our States. Many will agree that it is our resources and people that have made this a great Nation. Until recently, we considered our resources as limitless. While these resources were adequate, the map needs were primarily concerned with routes of communication and natural barriers to such routes. Engineering accuracy was not a cartographic requirement, and the topographic sketcher was the map maker. After two world wars and, shall we say, a half, with the use of our resources skyrocketing, it was apparent that more effort had to be made in finding other sources of supply and arranging plans for better use of those we did have. This development could not be started without basic topographic data on which to plan. Strangely enough, two of our resources, water and land, showed the first signs of shortages. Reclamation, drainage, and irrigation planners are the largest users of these maps, for how can one use the land without knowing its width, length, height, and configuration. Close behind are the mineral resource users and the mining interests, with the geologists in the vanguard. Following these are the petroleum group; the transportation group, with highway and waterway planning; the telegraph and telephone group with their microwave transmission towers; and about ten other active categories of users. Behind these large groups is the largest of all - the Department of Defense. With its vast problems of fighting global warfare and protecting this country from invasion, it was natural that it should expend its efforts for first things first. During World War II, the effort was mostly overseas mapping, with a small amount in this country. Recently, in 1951, the military again became conscious of the large unmapped areas in the perimeters of this country and, in conjunction with the Survey, developed what is now the defense mapping program. Calling for certain areas from the coast line inward, it has caused most of the State of Florida to be included in this category. In establishing area priority within the State, the Survey recognized that by proper programing the needs of both the Department of Defense and the State of Florida could be satisfied.

Before, during, and between World War II and 1952, the area west of Tallahassee and along the east coast, with considerable area in the vicinity of Tampa and St. Petersburg, had been mapped, though these combined areas represented but a small part of the State.

This year, there are nine mapping projects in one or more of the operational phases. These are the Shady Grove with 29 - 7-1/2′ quadrangles; the Suwannee with approximately 40 - 7-1/2′ quadrangles; the Inverness with 10 - 15′ quadrangles; the Fort Myers with 24 - 15′ quadrangles; the Kissimmee with 67 - 7-1/2′ quadrangles; the St. Johns Watershed project with 32 - 7-1/2′ quadrangles; the Florida Special with 6 - 7-1/2′ quadrangles, the Everglades with 15 - 15′ quadrangles; and the Marianna with 24 - 7-1/2′ quadrangles. Seventy-five of our parties completed the field work on the Kissimmee and St. Johns projects during this past field season, which recently closed. There was no field activity this past year on the other projects mentioned because of the greater demand for the mapping of the Kissimmee and St. Johns Watershed projects.

Last year, our field parties completed field work on the Marianna project and did the control on the Fort Myers, Inverness, and Shady Grove, with completion work on ten quadrangles of the Kissimmee project.

Last year, also, was our first large operation in Florida, and many of our engineers were on their first assignments in this type of terrain. This year, with added experience, our individual production has increased about fifty per cent. Now, whether or not we can maintain this production will depend on how well we whip the transportation problem in the Everglades, for, as many of you know, it is a most difficult country to get into. We have investigated swamp buggies and will also investigate the possibility of air lift. We have found that certain work done by the Corps of Engineers might be adopted and used as control. As usual with all our work, whenever we reach new areas, new problems arise which seem to baffle us. However, at the end of our seasons, our engineers have somehow met and solved these problems. Sometimes it is necessary to hike long distances into the area to be worked; occasionally, snakes or alligators provide distraction; sometimes swamps are barriers - but whatever the problems, sweat and perseverance seem to overcome most of them. During the month of March, I visited the field parties in Kissimmee, Okeechobee, Ft. Pierce, Vero Beach, and Cocoa - seventy-five parties in all. These areas represent a cross section of the country found throughout the State of Florida: the highlands around Sebring and the west side of the Okeechobee area; the swampy flatlands east of it, which, as one goes south from Kenansville, change to flatland with more dry areas; then along the St. Johns River where the headlands of the St. Johns Swamp, with its large drainage area, form the St. Johns River to the north and the St. Lucie River to the south.

The upper end of the St. Johns project, between the flowage to the north and the Everglades project to the south, is a heterogeneous area of flat ranch land, swamp potholes, and smooth-rolling orange grove land. To the east is the developed coast line area. The pattern for the rural area is fairly fixed. There we find swamp as nature left it, with some palmetto, pine, and cypress. Certain of these swamp lands have been drained and planted in sugar cane and tomatoes. The tomatoes, however, can only be planted once in every five years, and this area is then planted with grass for grazing or is allowed to revert to swamp land. The St. Johns Marsh, covering an area about five miles wide, starts south of Highway 60 and continues into the Wolf Creek quadrangle before a definite stream pattern is formed. South of this area is the swamp proper, made more noticeable by the presence of the air boat, a flat-bottomed boat propelled by an airplane motor, which is capable of traveling across the open swamps at high speeds. Toward the north end of the project, the country is divided into two major parts: the St. Johns River with Harney Lake and several others, joined by a large swamp area, and the flat, cleared ranch land.

The maps of the Kissimmee project were done by private contract for the Corps of Engineers. While the specifications called for standard accuracy, the maps were a special product. The base was a photo mosaic controlled by ground control. The cultural features, drainage, woodland, and other planimetric data were shown only by the photographic images without drafting. Contours were inked on the mosaics and were obtained by both stereocompilation and plane table field parties. By this method, the map product was obtained quickly and with sufficient detail to satisfy the agency buying it. When the Survey took these over to prepare a standard topographic map, a large amount of field work and office preparation was necessary to meet National standards. Roads and other cultural details had to be classified; drainage and hydrographic features had to be delineated and classified; names of places and features, together with land office adjustments, had to be obtained.

In scaling across sheets, the picture distortion was sufficient to create scale changes. These created problems at sheet edges. While the mosaic offers several advantages as a map supplement, its use as an orthographic projection is seldom satisfactory. I know that several proponents of this method will argue with me, but experience dating back many years, in both this country and overseas, using various methods of controlling mosaics, has failed to convince me that as a base for topographic mapping they are as accurate as a planimetric base compiled by Multiplex or other standard stereoplotters. The use of this type of manuscript for the subsequent color-separation drafting on blue line plates also caused considerable trouble. After experience was gained last winter, methods of bleaching out the photographic background were found, and this season the projects concerned were furnished with draftsmen who drafted the roads and other cultural features, then bleached out the unwanted backgrounds. The St. Johns project, joining the Kissimmee, was contoured in the field on blue line bases prepared from high-altitude photography. Later, prints of low-altitude flying were obtained from the Production and Marketing Administration and used by the engineers at the field offices to supplement the information previously obtained from the small-scale photography. These two types of flying were available and were used to avoid delaying the project. Under ordinary procedure, the area would have been flown to proper specification, which would have kept the field work at a minimum.

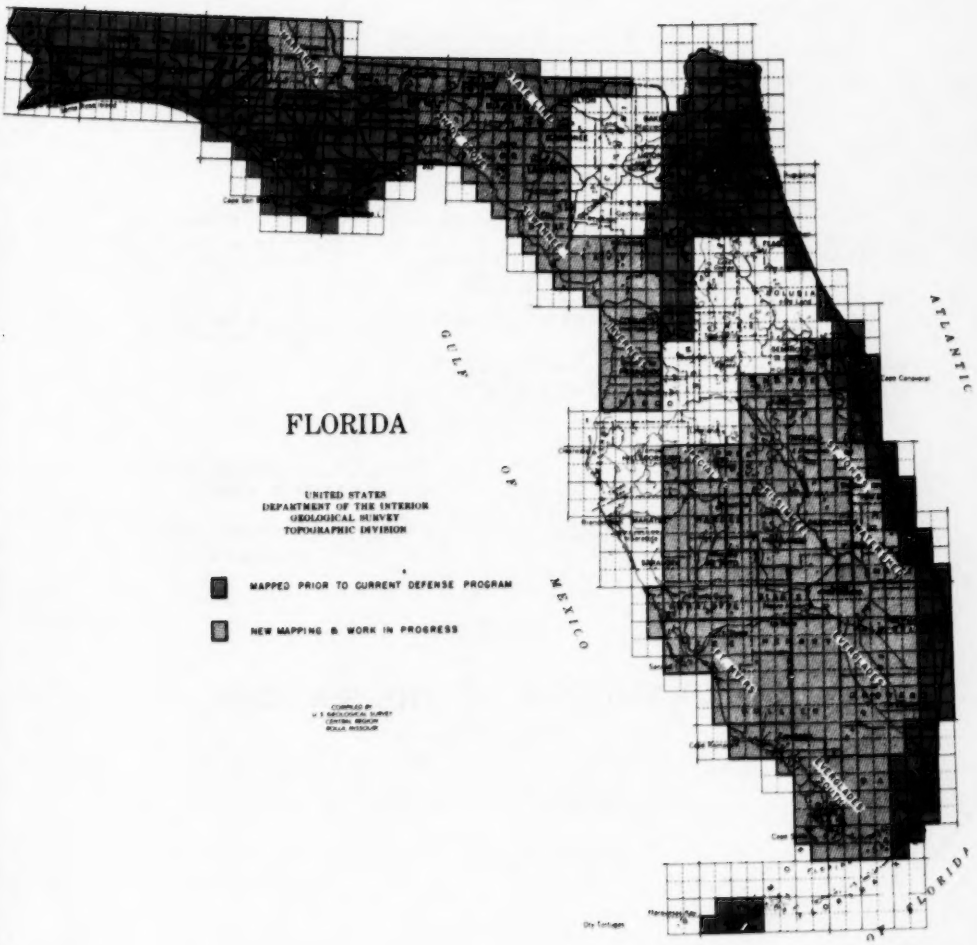
Next year's program, provided present capacities are maintained, will find us working the plane table contouring of the few remaining quadrangles of the Marianna project in the northwestern part of the State; the plane table contouring and completion of the quadrangles of the Inverness project in the west central part of the State; and the basic control on the quadrangles of the State Line Project in the central part of the north border of the State.

The stereocompilation has already been completed on the quadrangles of the Marianna and Inverness projects, and the aerial photography for the State Line Project has been completed and accepted.

The Marianna project is entirely a field contouring job, while much of the Inverness project was suitable for complete stereomapping on the Kelsh plotter.

During the past year, Florida has joined the many States now having a State Mapping Advisory Board. These boards, being comprised of engineers and other prominent persons from within the State with backgrounds of map appreciation, are in a position to advise the Survey of the local requirements for mapping and are invaluable in setting up priorities. They also get the results to all the potential users, which increases the value of the maps' information and saves engineering talent as well as dollars in planning.

Topographic mapping is one engineering job that to be of value tomorrow must be done today.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